

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/EP05/001991

International filing date: 23 February 2005 (23.02.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/548,828
Filing date: 27 February 2004 (27.02.2004)

Date of receipt at the International Bureau: 29 March 2005 (29.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

PCT/EP2005/001991

17.03.2005

PA 1289144

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APPLICATION NUMBER: 60/548,828

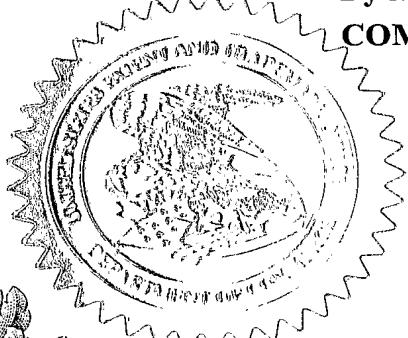
FILING DATE: February 27, 2004

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A handwritten signature of P. Swain.

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13142
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PTO/SB/16 (01-04)

Approved for use through 07/31/2006, OMB 0651-0032

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EL 975286709 US

14772 U.S.PTO
60/548828

022704

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TITLE OF THE INVENTION (500 characters max)

POLYMERIZATION INITIATOR SYSTEMS CONTAINING ALUMINUM COMPOUNDS AS CURING INHIBITORS AND POLYMERS

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ENCLOSED APPLICATION PARTS (check all that apply) (914) 674-5464

<input checked="" type="checkbox"/> Specification Number of Pages	5	<input type="checkbox"/> CD(s), Number _____
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<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76		

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.	FILING FEE Amount (\$)
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

<input checked="" type="checkbox"/> No.	REGISTRATION NO. 25,677 (if appropriate)
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Respectfully submitted,

SIGNATURE Richard P. FennellyDate Feb. 27, 2004TYPED or PRINTED NAME Richard P. FennellyREGISTRATION NO. 25,677
(if appropriate)
Docket Number: ACA6328PRUS

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POLYMERIZATION INITIATOR SYSTEMS CONTAINING ALUMINUM COMPOUNDS AS CURING INHIBITORS AND POLYMERIZABLE COMPOSITIONS MADE THEREWITH

Background of the Invention

5 The present invention relates to a novel curing inhibitor for amine organoborane complex polymerization initiators of the type described and claimed in U.S. Patent Application Publication No. 2002/0058764, the references described therein to Mottus et al., Skoultchi, Zharov et al., and Pocius, in the following related U.S. Patent Application Publication Nos. 2002/0025381, 10 2002/0028894, 2002/0031607, 2002/0033227, and 2003/0120005, and in the original U.S. Patent Application No. 09/466,321. All of these patent applications and patents are incorporated herein by reference as covering the amine organoborane complex 15 polymerization initiators that are useful in the practice of the present invention. As stated in at in paragraphs 0002 and 0009 of U.S. Patent Application Publication No. 2002/0058764, it is desired to have polymerization initiator systems that have enhanced stability in the presence of compounds having olefinic 20 unsaturation, thus improving the ability to cure on demand.

Summary of the Invention

One embodiment of the present invention is a composition comprising an organoborane/amine complex and an effective amount 25 of an aluminum compound to inhibit curing of the organoborane/amine complex when used as part of a polymerization initiator system containing one or more monomers, oligomers or polymers having olefinic unsaturation. Paragraph 0010 of U.S. Patent Application Publication No. 2002/0058764 provides a non-limiting but representative description of organoborane and amine 30 components that can be selected for use. The embodiments listed

in paragraphs 0011 and 0012 of this same patent publication are relevant to the use of this composition, and the statements made in paragraph 0013 regarding the characteristics of the composition also hold true for the composition of the present invention.

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Description of Preferred Embodiments

Paragraph 0014 and the first seven lines of paragraph 0015 of U.S. Patent Application Publication No. 2002/0058764 describe 10 the organoborane used in the complex while paragraphs 0017 to 0044 also describe certain amines that can be selected for use in the practice of the present invention. Other amines can also be used (for example, as described in U.S. Patent No. 5,935,711 in Cols. 5 to 8).

15 A variety of organoaluminum compounds of the formula Al_2R_6 can be selected for use in the present invention. In the preceding formula R is either C_1-C_{12} alkyl or C_1-C_{12} alkoxy, with each of the six R groups being the same or different. By extension, this formula also represents compounds explicitly 20 designated as AlR_3 and $Al(R)(R')_2$ for compounds of the formula with even numbers of alkyl and/or alkoxy groups. The R groups can be a mixture of about three alkyl groups and about three alkoxy groups. The terms "alkyl" and "alkoxy" as used herein includes both straight-chain and branched-chain groups.

25 Non-limiting examples of organoaluminum compounds within the scope of this invention include trimethylaluminum, triethylaluminum, tri-n-propylaluminum, tri-n-butylaluminum, triisobutylaluminum, tri-n-hexylaluminum, tri-n-octylaluminum, aluminum triethoxide, aluminum isopropoxide, aluminum tri-s-butoxide, aluminum tri-t-butoxide, diethylaluminum ethoxide,

diisobutylaluminum ethoxide, triethyl(tri-s-butoxy)dialuminum, tri-n-butyl(triisopropoxy)dialuminum, and mixtures thereof.

The organoaluminum compound can either be added directly to the organoborane prior to reaction with amine to prepare the 5 organoborane/amine complex or it can be added directly to the preprepared organoborane/amine complex.

The molar ratio of boron to aluminum in the composition is relatively important. If the molar ratio of boron to aluminum is too high, then the polymerizable composition made therewith may 10 experience an undesirable increase in viscosity. If the molar ratio of boron to aluminum is too low, the composition may be pyrophoric (the absolute ratio at which the composition is pyrophoric is dependent upon the organoaluminum compound that is used) or there may be problems with adhesion. The molar ratio of 15 boron to aluminum can range from about 1.0:1.0 to about 50.0:1.0. Within this described range, for example, the molar ratio of boron to aluminum can range from about 10.0:1.0 to about 30.0:1.0.

U.S. Patent Application Publication No. 2002/0058764
20 describes the organoborane/amine complex (at paragraph 0045), the polymerizable compounds and compositions (at Paragraphs 0046 to 0048), the preparation and properties of the organoborane/amine complex (at paragraphs 0049 to 0051) and the applications of the polymerizable compositions (at paragraphs 0052 to 0071 and 0073 25 to 0075).

What is Claimed:

5 1. A composition comprising an organoborane/amine complex and an effective amount of at least one organoaluminum compound to inhibit curing of the organoborane/amine complex when used as part of a polymerization initiator system containing olefinic unsaturation.

10 2. A composition as claimed in Claim 1 wherein the organoaluminum compound is of the formula Al_2R_6 , with R being selected from the group consisting of C₁-C₁₂ alkyl and C₁-C₁₂ alkoxy and with each of the six R groups being the same or
15 different.

3. A composition as claimed in either Claim 1 or Claim 2 having a molar ratio of boron to aluminum of from about 1.0:1.0 to about 50.0:1.0.

20 4. A composition as claimed in either Claim 1 or Claim 2 having a molar ratio of boron to aluminum of from about 10.0:1.0 to about 30.0:1.0.

25 5. A composition as claimed in any Claims 1 to 4 wherein the organoaluminum compound is one or more of trimethylaluminum, triethylaluminum, tri-n-propylaluminum, tri-n-butylaluminum, triisobutylaluminum, tri-n-hexylaluminum, tri-n-octylaluminum, aluminum triethoxide, aluminum isopropoxide, aluminum tri-s-butoxide, aluminum tri-t-butoxide, diethylaluminum ethoxide,

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diisobutylaluminum ethoxide, triethyl(tri-s-butoxy)dialuminum,
tri-n-butyl(triisopropoxy)dialuminum.

6. A composition as claimed in any Claims 1 to 5 wherein
5 the organoaluminum compound was added to an organoborane prior to
reaction with amine in preparing the organoborane/amine complex.

7. A composition as claimed in any Claims 1 to 5 wherein
the organoaluminum compound was added to a preprepared
10 organoborane/amine complex.

8. A polymerizable composition comprising one or more
monomers, oligomers or polymers having olefinic unsaturation and,
as the initiator system, the composition of any of Claims 1 to 7.